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as the origin, we have $\sqrt{x^2+y^2}$ as the distance from any point $(x, y)$ to the focus and $x$ as the distance from that point to the directrix. Hence, if the point is on the locus,

$$\sqrt{x^2+y^2} = ex$$

and squaring we get the required equation.

For $e > 1$, $e = 1$, $e < 1$, this reduces to the equations of two intersecting lines, two coincident lines and a point respectively.

## II. TWO USEFUL RELATIONS IN TRIGONOMETRY.

By ALBERT BABBITT, University of Minnesota.

If $ABC$ be any triangle, and if $\theta$ be the angle which a straight line $CP$ (Fig. 1) drawn from the vertex $C$ makes with the base of the triangle, and if we let $\angle PCA = \alpha$, $\angle BCP = \beta$, $AP = m$, $PB = n$, we then have

$$(m+n)\cot\theta = m\cot\alpha - n\cot\beta.$$

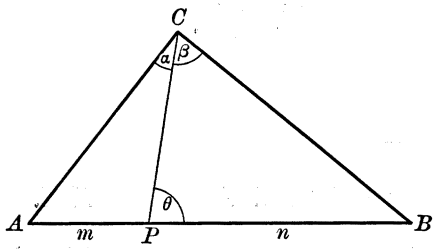


FIG. 1.

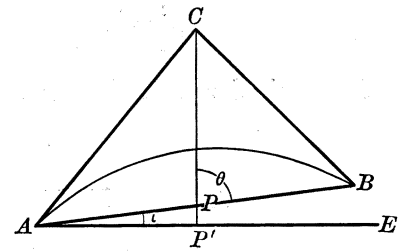


FIG. 2.

The proof of this trigonometric relation is very simple.[1] From $\triangle ACP$, we have

$$\frac{CP}{m} = \frac{\sin A}{\sin\alpha},$$

hence,

$$CP = \frac{m\sin A}{\sin\alpha} = \frac{m\sin(\theta-\alpha)}{\sin\alpha} = m(\sin\theta\cot\alpha - \cos\theta). \qquad (1)$$

Similarly, from $\triangle PCB$, we have

$$CP = \frac{n\sin B}{\sin\beta} = \frac{n\sin(\theta+\beta)}{\sin\beta} = n(\sin\theta\cot\beta + \cos\theta). \qquad (2)$$

From (1) and (2) it follows that

$$m(\sin\theta\cot\alpha - \cos\theta) = n(\sin\theta\cot\beta + \cos\theta).$$

Simplifying and dividing through by $\sin\theta$ (since $\sin\theta \neq 0$), we get

$$(m+n)\cot\theta = m\cot\alpha - n\cot\beta.$$

[1] Other proofs are given in, for instance, Loney's *Elements of Statics and Dynamics*, tenth edition (1896), page 92. EDITOR.

Using the same figure and notation, we can derive in a similar way the relation,

$$(m + n) \cot \theta = n \cot A - m \cot B.$$

These trigonometric relations facilitate the solution of some problems in physics.

For example, having given the direction and velocity of projection, let it be required to find the velocity with which a projectile would strike an oblique plane.

If we denote by $i$ the inclination of the plane to the horizon (Fig. 2), and apply the second relation above derived, noting that tangents at two points $A$ and $B$ of a parabola meet on the diameter bisecting $AB$, we get

$$\cot A - \cot B = 2 \tan i.$$

Hence, we determine the angle $B$, since the angles $A$ and $i$ are known. But, if $AC$ and $BC$ are tangents at two points $A$ and $B$ on a parabolic trajectory, and $V_1$ and $V_2$ the corresponding velocities, then

$$\frac{V_1}{V_2} = \frac{\sin B}{\sin A} \quad \text{and} \quad V_2 = \frac{V_1 \sin A}{\sin B},$$

and the required velocity is determined.

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## THE CHARTER MEMBERSHIP OF THE ASSOCIATION.

The By-Laws of the Association provided that those who should be elected to membership before April 1, 1916, should constitute the list of Charter Members. Owing to circumstances beyond our control the issue of the Monthly containing the report of the Columbus meeting and the announcement of the conditions of membership could not be distributed to the public till well into February. Similar delays of subsequent issues likewise prevented the prompt distribution of other information, so that the great flood of applications came late in March, thus making it impossible to complete the report until the present time.

The following is a preliminary report of the charter membership giving only the name of each member and the institution represented. As soon as possible there will be published a complete directory, giving the official position and mailing address of each member. Meanwhile, we invite careful scrutiny of the present list in order to detect any omissions or errors which may have escaped the attention of the secretary in the arduous task of checking up the returns.

It was assumed that all who joined in the call for the Columbus meeting, or took part in that meeting, would consider themselves eligible to charter membership, and the executive committee of the Council so ruled. From eighteen of these five hundred persons we had not, on going to press, received any expression of their intention, but we are provisionally including their names in the list below, pending the receipt of such information.